Compact and Highly Efficient Multi-Purpose Laser

Completed Technology Project (2014 - 2015)

Project Introduction

Many future NASA sensors will employ lasers to measure parameters of the atmospheres and surfaces of Earth and other planets, and to assist navigation and operation of space vehicles and aircraft. These sensors would benefit tremendously from increases in efficiency and laser power, with corresponding decreases in mass and power budgets. A new laser concept capable of generating relatively high pulse energies with over an order of magnitude higher efficiency and about a third of the mass of current lasers is being developed.

Conventional solid-state lasers can generate high pulse energies but suffer from low efficiency. Fiber lasers offer optimal efficiency, but they cannot produce required pulse energies for most NASA applications. A novel hybrid fiber/solid state laser for generating relatively high pulse energies with over an order of magnitude higher efficiency and about a third of the mass of current lasers is proposed. High spatial and spectral beam quality of the laser can improve the instrument sensitivity and precision. The new laser architecture can be implemented at any of the fundamental wavelengths of 1.0, 1.5, or 2.0 microns. The successful demonstration of this novel laser will profoundly affect the design of all infrared lasers for a wide range of applications from medical to military, and from telecommunication to manufacturing. Due to much reduced power, size, and mass, this laser will allow for significant cost saving in deployment of instruments in space thus creating new opportunities for Earth and planetary observation systems.

Anticipated Benefits

ASCENDS, DWAN, Lunar and Mars Landing missions.

Advanced infrared lasers for a wide range of applications from medical to military, and from telecommunication to manufacturing.

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Center Innovation Fund: LaRC CIF

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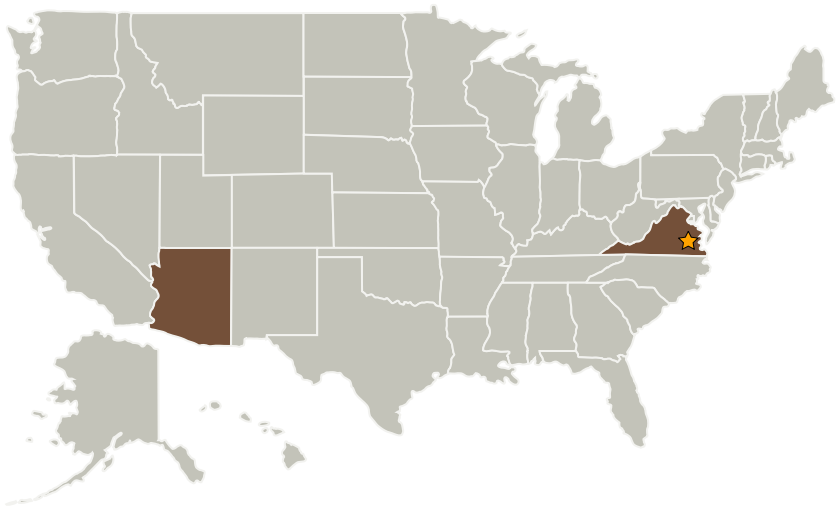
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia

Co-Funding Partners	Type	Location
AdValue Photonics, Inc.	Industry Small Disadvantaged Business (SDB)	Tucson, Arizona

Primary U.S. Work Locations	
Arizona	Virginia

Project Management

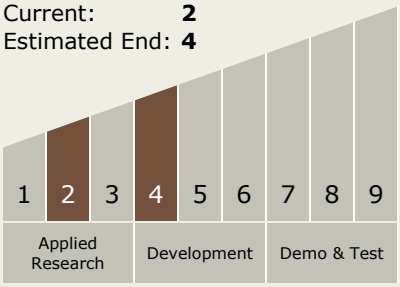
Program Director:
Michael R Lapointe

Program Manager:
Julie A Williams-byrd

Principal Investigator:
Farzin Amzajerdian

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers